Alternative 8

Chain-of-Lakes Isolated Facility

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Emphasis

This alterative emphasizes the improvement of export water quality, protection of fish from diversion effects, and increased water supply reliability through construction of an isolated in-Delta facility consisting of a series of Delta islands linked by siphons into a "chain-of-lakes."

Distinguishing Features

Physical and Structural Features

Converts selected low-elevation islands between Sacramento River and project export pumps into storage reservoirs connected by inverted siphons beneath Delta channels. Diverts water through multiple screened intake structure(s) along its length. Moderate level of habitat restoration. Expands or creates additional reservoir/groundwater storage capacity downstream. Obtain 100 TAF on San Joaquin River and manage for environmental purposes.

Operational and Management Features

Multiple diversion locations allow diversions at times and locations that cause the least environmental harm. Water stored in the chain-of-lakes would support export pumping during times of high environmental sensitivity. Upstream reservoirs could be operated in conjunction with the chain-of-lakes storage to increase supply available for environmental and other uses. The island storage system could be filled and lowered several times within a given year.

Institutional and Policy Features

Improves pollutant source controls and enforcement for urban and agricultural drainage, remediates on-site mine drainage, and uses a watershed management approach to reduce and treat high-priority pollutant sources. Increases agricultural, municipal, and industrial conservation and reclamation including land fallowing and water pricing measures.

Benefits

- Improves ecosystem quality through habitat restoration
- Multiple diversion points reduces diversion effects
- Improves water supply predictability and reliability
- Improves export water quality
- Reduces vulnerability of Delta functions to catastrophic failure

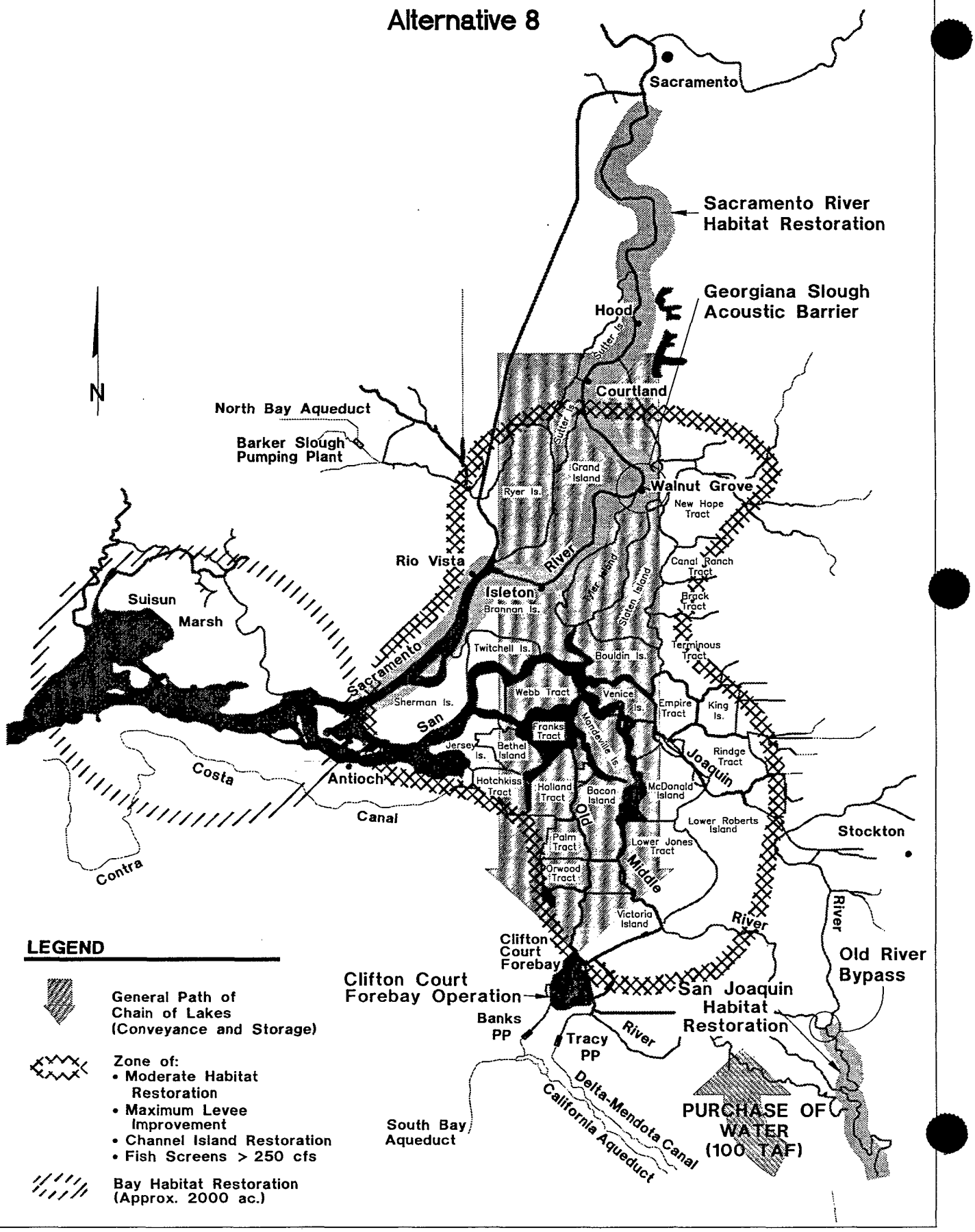
Constraints and Concerns

- Organic carbon contributions must be managed and reduced
- Environmental, social equity impacts of raising or building additional reservoirs, creating facilities, converting existing economic land uses
- Potential for degraded water quality in south Delta

PRELIMINARY DRAFT

Chain of Lakes

Alternative 8



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Alternative 8

Chain-of-Lakes Isolated Facility

This alternative enhances export water quality, primarily by modifying and constructing in-Delta physical facilities. Key elements include the conversion of selected low-elevation islands along a north-south axis between the Sacramento River and the CVP and SWP pumps from their present uses into storage reservoirs connected by a series of inverted siphons beneath Delta channels. Multiple, screened intake structure(s) deliver water into the island reservoirs. Diverted water is conveyed from the island reservoirs to the export pumps.

A single element of this facility might provide benefits for water supply reliability, water quality, system vulnerability, and ecosystem quality. If organic peat soils are excavated from the interior of the reservoir islands, the capacity of the facility would be increased, benefiting water supply reliability. This would reduce exposure of the water to organic carbon, improving water quality. The excavated material could be used to construct very broad levees around the reservoir islands, and perhaps on adjacent islands, reducing system vulnerability. These broad levees, up to several hundred feet wide, could be used for restoration of riparian forest, shaded riverine, and shallow water habitat.

This alternative is optimized by using it in conjunction with increased upstream and export area reservoir storage capacities. The multiple points of diversion allow more water of higher quality to be diverted at times of the year (generally the early winter months) when impacts on fish and other aquatic organisms are least. Accumulation of natural organic material in the water supply will be minimized through techniques such as the use of clay sealant layers placed over the peat soils. Use of the island reservoirs for ecological restoration would be balanced with the need to avoid contamination of the water supply.

Physical and Structural Features

Construction and Improvement of Conveyance Facilities— Convert selected Delta islands into an interconnected storage and conveyance system (the "chain-of-lakes concept") extending from a northern diversion or diversions, located on the Sacramento River (between Hood and Rio Vista), to the project export pumps. Flood and/or dike selected islands/tracts such as Grand, Brannan-Andrus, Tyler, Staten, Twitchell, Bouldin,

Bradford, Webb, Venice, Mandeville, Medford, McDonald, Holland, Bacon, Palm, Orwood, Woodward and Victoria Islands; and Pierson, Byron, and Franks Tracts. Connect them with a sequence of single or multiple inverted siphons installed beneath the intervening channels. Add pump stations at selected locations as necessary to generate the additional pump lift needed to optimize island water storage capacities and deliver water at the surface water elevation of an enlarged Clifton Court Forebay. The total storage capacity would equal approximately 300,000-600,000 acre-feet. Water stored would also be made available for south Delta agriculture during summer months.

Minimize TOC Contribution— Methods to reduce naturally occurring organic carbon releases from peat soils will be utilized. Methods such as excavating peat soils or adding clay soil liners will be evaluated.

Flood Protection Level— This action provides a maximum level of protection to Delta system levees. First, all levees not yet providing a level of protection equivalent to the hazard mitigation plan (HMP) will receive the necessary upgrades to their levees to meet HMP standards. A level of flood protection equivalent to the maximum credible earthquake (MCE) standard would be provided to critical levees surrounding west-side islands used for the Chain of Lakes storage facility. In addition, a level of flood protection equivalent to the US Army Corps of Engineers' Public Law (PL)- 99 standard would be provided to: 1) islands having infrastructure of local importance (such as New Hope Tract, Bouldin Island, Sherman Island, Palm Tract, Lower and Upper Jones Tracts, and Lower Roberts Island); and 2) islands having valuable habitat, but not necessarily infrastructure, (including, but not necessarily limited to Canal Ranch, Brack Tract, Staten Island, Venice Island, Rindge Tract, Webb Tract, Big Mandeville Island, Twitchell Island, and Bradford Island).

Levee Maintenance— Levee maintenance and stabilization (e.g. stabilizing berms), the modification of agricultural practices to reduce subsidence potential, setback levees, providing funding for maintenance and stabilization, and maintaining and/or reconstructing levees are indicative of the range of actions that would be implemented with the intent of reducing the risk of the Delta levee system with respect to its value in providing water supply, water quality, ecosystem quality, and land use/infrastructure benefits.

Delta Levee Habitat Restoration— Restore approximately 100 levee miles of shallow water, riverine and riparian habitat in the Delta to provide forage and cover habitat for

resident and anadromous fish, and to provide other benefits associated with riparian habitat. Actions might include setback levees, creation of berms, creation of shallow water habitat, and increased vegetation on levees. Considerations for site selection will include distance from hazards such as pumping plants, protection from waves generated by wind and boat wakes, importance of island integrity to the maintenance of Delta water quality, and need to improve channel capacity and structural stability of levees. Good candidate areas are Twitchell Island along Threemile Slough and Sevenmile Slough, Georgiana Slough, and the north and south forks of the Mokelumne River.

Delta Habitat Restoration— Restore shallow water and tidal wetland habitat in the Delta to provide spawning areas, forage areas, and escape cover for juvenile salmon, Delta smelt, splittail, and other species. Candidate areas include Prospect Island, Liberty Island, Little Holland Tract, Decker Island, Hastings Tract, Yolo Bypass, and the southeast Delta. Also restore shallow water shoreline habitat along margins of the lower Sacramento and San Joaquin channels, and tributary sloughs including Georgiana Slough, Barker Slough, Lindsey Slough, and Parker Island. Riparian, wetland, and terrestrial habitat would also be restored on Delta islands and upland areas adjacent to river channels.

Fish Screens— Install fish screens on diversions over 250 cfs in fish migration routes in the Delta, on rivers, and on tributaries.

Sacramento River Habitat Restoration— Restore habitat and geomorphic processes along the Sacramento River upstream of the Delta to increase survival and spawning success of anadromous fish, and to provide other benefits. Construct segments of meander belt where feasible (such as Red Bluff to Colusa) and restore segments of riparian habitat in more controlled stretches of the river (Colusa to Knights Landing.)

San Joaquin River Habitat Restoration— Restore channel features to improve fish survival. Actions may include restoration of deeper, narrower channel areas to keep water cooler, and isolation of quarry areas to protect young fish from predation and straying.

Bay Habitat Restoration— Restore about 2,000 acres of tidal wetlands between Collinsville and Carquinez Strait. Actions may include conversion of diked wetlands to tidal wetlands or use of dredge spoils to create wetland areas. The resulting habitat types

will provide wet year spawning habitat for Delta smelt, rearing areas for salmon, as well as habitat for diverse wildlife including canvasback and redhead ducks.

Increase Downstream Storage— Existing and/or new reservoir storage capacity is expanded, facilities and operations are modified to increase groundwater storage and conjunctive use, export diversion capacity is increased, and other supporting measures are undertaken to maximize the flexibility of diversion and export timing. These measures can also help provide additional flood protection.

Operational and Management Features

Features— The chain of lakes would consist of a series of Delta islands linked by siphons, existing channels, or new channels constructed across islands to the CVP and SWP export pumps. The total storage capacity would be approximately 300,000-600,000 acre-feet. Combined intake capacity would equal approximately 25,000 cfs (five screened intakes at 5,000 cfs each). One intake would be located in the North Delta, one at the Clifton Court Forebay, and the remaining at various locations on the islands.

The multiple diversion locations would allow diversions at times and locations that cause the least environmental harm. Water would be diverted for storage onto the islands during winter storm events when there is considerable water in the Delta and when fish generally aren't migrating through the Delta. The stored water would be released during periods of high environmental sensitivity and during the spring and summer as needed either for exports or for Delta outflow. The island system might be filled and lowered several times within a given year.

Upstream reservoirs would have increases in amount of stored water because of increased diversion opportunities and Delta storage provided by this alternative. Any increased yield could be balanced between increased environmental flows and increase in reservoir carryover storage. New, more protective, environmental standards could be set for the Delta, based upon the new flexibility:

Obtain Environmental Water— Obtain about 100,000 acre feet from San Joaquin water users to reduce conflicts between fisheries and diversions. Water could be used to provide pulse flows to move Delta smelt downstream, away from diversion points. Another use might be dilution of poor quality San Joaquin River flows, providing

benefits for fisheries, water supply, and water quality. New south-of-Delta storage would allow this water to be used as exchange water so that Delta diversions could be reduced at critical times to protect fisheries without affecting export supplies.

Mark Hatchery Fish— Mark salmon produced in hatcheries to facilitate selective catch by commercial and recreation fisheries.

Pen Rearing of Striped Bass— Rear striped bass in pens to maintain recreational fishery and avoid operational constraints on water projects due to spawning bass.

Response Program for Non-Native Species Control— Establish and fund a rapid response program among environmental agencies to provide a fast and effective means of managing non-native species introduced to the Bay-Delta. Carry out or expand continuing management programs for nuisance species such as water hyacinth.

Control Volume of Agricultural Discharges— Selected agricultural water quality management measures, such as those directed at drainage volume control, can reduce agricultural water demands and increase in-Delta flows.

Manage Irrigation Tailwater to Reduce Pesticides— Utilize wetlands, treatment processes, or holding reservoirs to store or retard surface agricultural drainage, reduce pesticide concentrations, and/or make releases during higher instream flow periods.

Retain and Manage Stormwater Runoff— Create wetlands, buffer strips, treatment processes, or holding reservoirs to reduce contaminant concentrations and to store or retard contaminated flows and stormwater drainage for release during periods of higher instream flows.

Construct Wetlands— Utilize wetlands for natural treatment and detention to reduce contaminant concentrations and make releases during periods of higher instream flows.

Institutional and Policy Features

Emergency Levèe Management Plan— An emergency levee management plan would identify necessary funding and direction to reclaim Delta islands in the event of inundation to continue protection of Delta functions as an integrated resource system. Funding would be provided to ensure that a suitable amount of equipment and materials would be readily available to rapidly respond to flood fights.

Subsidence Reduction— Efforts to reduce the subsidence on Delta islands with deep peat soils which are not used for the Chain of Lakes, will include the establishment of a landside buffer zone between 100 and 200 yards in width, located adjacent to the levee.

Increase In-Stream Flows Through Transfers and Conjunctive Use— Water transfers and conjunctive use programs would be specifically designed to improve local Delta tributary flows and San Joaquin tributary flows. The exchanged water would result in increased in-stream flows which would then improve overall Delta water quality and specifically south Delta water quality for environmental benefits during critical summer months. For local Delta tributary users, such as EBMUD and agricultural users, as an exchange for their local Delta tributary flows, water would be provided through a connection to the Chain-of-Lakes facility.

Manage Crops for Waterfowl Forage Production— Work with adjacent land owners to encourage the expanded use of crops which also provide benefits to wildlife.

Improve Pollutant Source Controls— Existing source control regulations for pollutants may not be sufficiently comprehensive nor enforced to levels required to protect beneficial uses in the Bay-Delta system and tributary rivers. In particular, source controls are needed in the San Joaquin Valley. These actions would provide for an array of increased source reduction activities such as additional regulation of agricultural and urban drainage and better enforcement, establishing BMP's for a range of activities affecting Delta water quality such as levee maintenance and pest control practices, and supporting and enhancing existing land retirement and fallowing programs. Using a watershed management approach, identify and control high priority pollutant sources through a combination of source reduction and treatment actions. Provide regulatory incentives and develop institutional agreements to enable focusing resources on priority sources.

Implement on-site mine drainage remediation measures based on requirements in current regulations. Through changes in water pollution requirements give urban areas flexibility to fund high-priority mine cleanup in lieu of increasing expenditures on treatment plant improvements.

Intense application of core level actions such as implementing source control regulations for pollutants, retirement of lands with serious drainage disposal problems, retirement or fallowing agricultural lands with salt or other contaminant drainage problems to reduce land-derived salt contamination, management of irrigation tailwater, retention and management of stormwater runoff, and management of discharges from abandoned mining sites would improve water quality management.

Reduce Water Demand on Delta and Increase In-Stream Flows— Use a variety of actions involving increased agricultural, municipal, and industrial conservation and reclamation; acquisition of supplemental water; and expanded use of desalination with the intent of reallocating the freed-up water supplies for use as in-stream dilution flows and to reduce salinity levels. Conservation strategies would include encouraging land fallowing and water pricing measures. The freed-up supplies would then be available to provide water quality protection through dilution and habitat improvements such as improved temperature and pulse flows during critical migration periods.

Preliminary Assessment

Benefits

Ecosystem Quality— A major benefit is achieved by relocating the export diversion from the current south Delta location thus reducing entrainment impacts. Habitat restoration significantly improves ecosystem quality.

Water Supply— Supply predictability is greatly improved with this alternative because threatened and endangered species constraint impacts on diversions at their new locations will be less in magnitude and frequency. Increased storage and reclamation will augment water supplies and improved local storage and conjunctive use will make additional alternate supplies available when needed.

Water Quality— Overall export water quality is improved by direct access to higher quality Sacramento River water. Over time, the volume and salt load in

agricultural drainage will be greatly reduced due to the improved quality of applied irrigation water and irrigation efficiency.

System Reliability— The upgraded levees reduce flood overtopping and levee failure risks and associated water quality degradation potential. The probability of a prolonged shutdown of the water projects and local diversions will be greatly reduced. Implementation of the subsidence reduction program will allow remaining agricultural, recreational and associated land uses to continue. Levee maintenance actions will provide additional protection against flood- and seismically-induced levee failures for the selected storage islands, and reduce the risk of system-failure or water quality-induced shutdowns and export curtailments.

Constraints and Concerns

Organic Carbon— Organic carbon contribution must be managed and reduced.

Site-Specific Impacts— Environmental, social, equity impacts of raising or building additional reservoirs, creating facilities, converting existing economic land uses.

Water Quality— Potential for degraded water quality in south Delta.